

Remarks

1. Status of the Claims

Claims 1-26, 28-49, and 51-70 were pending. Claims 1-19 are withdrawn from consideration. Claims 21, 22, 34, 44, 45, and 57 are canceled above. Claims 20, 24, 31, 33, 43, 47, 51, 54, 55, 56, 68 and 70 are amended. Claims 71-76 are added. This leaves claims 20, 23-26, 28-33, 35-43, 46-49, 51-56, and 58-76 for reconsideration and examination.

2. Claim Objections

The informalities in claim 31 and 54 noted by the Examiner have been corrected by amendment. The Examiner's keen attention to such matters is appreciated.

3. Rejection of Independent Claims

All pending claims (20-26, 28-49, and 51-70) were under 35 USC §103(a) as being unpatentable over Kartchner (US 5,914,014) in view of Araya *et al.* (US 6,583,394) and Walker (US 3,818,333).

Kartchner explicitly teaches only a single embodiment, in which microwave energy is introduced from outside each of two dual feedstock treatment processing chamber spaces or volumes into the interior of each volume through each of two opposed microwave transparent windows. There is no doubt that the microwave emitter is entirely outside the enclosure of each volume, and therefore it simply is not *wholly immersed within* such volume. Kartchner discloses only this single embodiment and does not even hint that there could be any other embodiment within the scope of his disclosure. Thus, a skilled artisan would be motivated *not* to modify the Kartchner configuration to arrive at an immersed configuration, as that would only risk rendering Kartchner inoperative for its sole disclosed purpose.

Furthermore, neither of the secondary references discloses or suggests a wholly immersed configuration. Araya's microwave generator is mounted outside a kiln and connected by a roof-mounted or side-mounted waveguide, and thus any "antenna" portion of his

disclosure is not immersed within the containment chamber. Similarly, Walker shows an externally mounted microwave generator/detector system coupled to oppositely-directed outside-mounted antennas, not an immersed antenna structure. Thus neither Araya nor Walker is any closer to the claimed invention than Kartchner, and therefore their combined teachings do not account for every structural limitation of the claimed invention. Nor can it be fairly said that there is any evidence on the record that the person of ordinary skill in the art would be motivated to modify the teachings of these references from externally-provided configurations into the exact opposite, namely immersed configurations. Absent such teachings and the motivations to combine them, a *prima facie* case of obviousness has not been made.

A second major deficiency in the teaching of the combination of references concerns the structure of the antenna, specifically the synergy between the shape of the antenna body and the size and location distributions of the slots in the antenna body. Kartchner discloses only a rectangular cross-sectioned antenna, without any slots at all. Araya discloses only a similarly rectangular cross-sectioned antenna, along with a variety of slot configurations discussed at length below. The Examiner cites Walker only for his “apertured applicator 10” but Walker’s element 10 is a material hopper, not a radiation antenna; it appears this may be a typographical error because Walker discloses a transmitting antenna 18 although it has only a single microwave window 14 and thus nothing akin to a slotted configuration. Thus, the Examiner correctly cites only Araya as disclosing a slotted waveguide.

Close reading of Araya, however, reveals that he enables only “a graduated distribution of slots with increasing distance from the source as illustrated in FIGS. 5-8 of the drawings” that “can allow for more uniform leakage of the waves.” Column 8, lines 19-21. Araya never discloses a series of uniformly spaced slots. It is also evident that Araya’s Figures 5-8 disclose only slots that are uniform in width, each such slot being just slightly less than the width of each of his waveguides 12. To be sure, Araya previously includes various other general statements in the same column, lines 4-16, but they are wholly general assertions without enablement, particularly in the context of a tapered antenna. Therefore, they would not motivate the person of ordinary skill at all,

much less to the degree that Araya's specific teaching of a graduated size distribution to accomplish "*more uniform leakage of the waves*" would do so.

Given that Kartchner and Walker each disclose only a single microwave window and not slots, it is clear that there is no reason, much less a motivation or expectation of success, to combine the slots of Araya and either of the other two references. In fact, the ordinary artisan would be motivated not to modify Walker, because Walker teaches a matched pair of mutually-directed antennas *and* detectors, for the express purpose of measuring the characteristics of the material in the hopper. Thus, Walker teaches a system that is *focused* in nature (otherwise the emitted microwaves would escape the narrowbeam detector), while Araya (per the Examiner's interpretation) teaches slots that are intended to *diffuse* the microwave energy without detection. These diametrically opposed purposes are strong evidence against the combination advanced by the Examiner. Furthermore, the superficial statement in Kartchner cited by the Examiner is deficient as it is completely silent on slot size and configuration; indeed, there is nothing in the cited passage to even suggest a slotted antenna at all, even if it is tapered.

Against these clear shortcomings of the prior art, there can be no doubt that the amended claims structurally describe the unexpected result that a uniform energy distribution does *not* require the graduated location distribution mandated by Araya. As disclosed in paragraph [0050] (including Table 1) and Figure 3 of the application, slots **60** that are evenly distributed in location along a tapered waveguide and have continuously varying width are optimal for a tapered antenna, which overcomes the loss of available energy due to signal attenuation. "To counteract this attenuation, the antenna body **54** preferably is tapered so as to amplify the RF signal as it propagates down the antenna body **54**." (Paragraph [0053], fifth sentence.) "Tapering the antenna in this way amplifies the RF signal at the distal end of the antenna to counteract attenuation of the RF signal as it is propagated along the length of the antenna. Efficient radiation of microwave energy into the substantially the entire contained treatment volume 12 is facilitated as a result." (Paragraph [0031], third and fourth sentences.) This improved performance over the prior art is a direct result of the structural features now claimed, specifically the combination of the tapered waveguide *and* the slot configuration, taught together in the application and

not appreciated by the prior art of record, alone or in combination.

Language to structurally distinguish the claimed invention from the cited combination of references is specifically added by the amendments above. Using claim 20 as representative of each independent claim (the other independent claims being claims 43 and 68), such structural distinctions may be identified as: (1) those related to the immersion of the RF applicator entirely within the containment volume, such as “surrounded by the emulsion within the treatment volume,” “formed around the antenna volume,” and so on; and (2) those related to the shape of the antenna body and the size, orientation, and distribution of the slots of the antenna body, specifically “tapered in width,” “continuously varying slot width ... substantially parallel to each other,... distributed even along and substantially perpendicular to the longitudinal axis.” Similar, if not identical, language has been added to the other two independent claims, and therefore they are patentable for the same reasons.

For these reasons, the rejections for obviousness should not be maintained against the amended claims.

4. Rejection of Dependent Claims

Each of claims, 23-26, 28-33, 35-42, 43, 46-56, 58-67, and 69-76 depends upon one of the independent claims discussed above, and therefore each is allowable for the reasons advocated above.

Conclusion

Please enter the amendments above and reconsider the application in light of the entire set of amendments and remarks. If you have any questions, please contact me at your convenience.

Sincerely,

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